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Fiscal Year 2001 Aquifer Tube Sampling Data Transmittal/Approval ~~083343~~
October 2000

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APPROVAL: Arlene C. Tortoso Date 10/17/00
Arlene Tortoso, Groundwater Unit Manager, DOE/RL (H0-12)

APPROVAL: for Date 10-17-00
Larry Gadbois, Project Manager, EPA (B5-01)

APPROVAL: John B. Price /for Date 10-18-00
Wayne Soper, Project Manager, Ecology (B5-18)

Fiscal year 2001 aquifer tube sampling and analysis instruction, and attachments will include the following:

Attachment A	--	Meeting Minutes of October 5, 2000
Attachment B	--	Aquifer Sampling Tube Summary Table, Fall 2000
Attachment C	--	100-BC-5 Groundwater Well Aquifer Sampling Tube and Seep List from 100-BC-5 Waste Control Plan
Attachment D	--	100-FR-3 Groundwater Well Aquifer Sampling Tube and Seep List from 100-FR-3 Waste Control Plan

Concurrence by: Bob Raidl Date 17OCT2000

Bob Raidl, CHI Aquifer Sampling Tube Task Lead (H9-02)

SAMPLING AND ANALYSIS INSTRUCTION FOR AQUIFER SAMPLING TUBES, FALL 2000

1.0 INTRODUCTION

Results of aquifer tube sampling are used for the following:

- Verifying the presence or absence of contaminants of concern (COCs) at locations along the Columbia River shoreline
- Increasing knowledge of the nature, concentration, and extent of chemical and radiological indicators and the COCs in the groundwater at locations adjacent to the river
- Increasing understanding of the vertical distribution of contamination in the aquifer adjacent to the Columbia River
- Supplying data for risk assessments
- Supporting final action decisions for interim remedial actions that are underway at the 100-H, 100-K, and 100-D Areas
- Supporting monitoring efforts for other Hanford Site projects.

The following section provides background information about the project, a summary of the results from any previous investigations, and a list of the contaminants of concern (COCs).

1.1 BACKGROUND

The Hanford Site became a Federal facility in 1943 when the U.S. Government took possession of the land to produce nuclear materials for defense purposes. The Hanford Site's production mission continued until the late 1980s, when the mission changed from producing nuclear materials to cleaning up the radioactive and hazardous wastes that had been generated over the previous 45 years.

Aquifer sampling tubes are small-diameter polyethylene tubes that have a screen at the lower end. The tubes are implanted into the aquifer by driving a temporary steel casing into the ground and inserting a tube into the casing. The end of each tube is fitted with a screened section that acts as the sampling port. The temporary steel casing is driven by either a hydraulic ram attached to a vehicle or by a hand-carried pneumatic air hammer. The steel casing is then backpulled, leaving the tube (and the stainless-steel drive point) in place. Water is withdrawn from the tube using a peristaltic pump. The tubing exposed at the ground surface is of minimal length (several feet) and is protected from wildlife and the elements by polyvinyl chloride conduit.

1.2 PREVIOUS INVESTIGATIONS

After completion of initial porewater studies, installation and sampling of the first 14 aquifer sampling tubes occurred in October and November 1995 along the 100-D/DR Area shoreline. Aquifer sampling tube DD-39, located adjacent to the high hexavalent chromium (632 pCi/L) porewater sampling site, reported up to 839 pCi/L of hexavalent chromium. The result of this effort was documented by *Chromium in River Substrate Pore Water and Adjacent Groundwater: 100-D/DR Area, Hanford Site, Washington* (Hope and Peterson 1996) and led to the discovery of the chromium hot spot plume located west of the D and D/R Reactors.

Aquifer tube locations and sampling methodology were developed in a series of workshops held by Environmental Restoration Contractor (ERC) personnel with RL, the U.S. Environmental Protection Agency, the Washington Department of Health, and the Washington State Department of Ecology during July 1997 (Borghese et al. 1997). Tubes were installed and sampled at 70 of the planned 89 additional locations in September through November 1997. Each location was equipped with one to three tubes, for a total of 178 new aquifer sampling tubes. Water was withdrawn from each installed tube, and the sample with the highest specific conductivity greater than 200 μS/cm (judged to be most representative of groundwater) was selected for additional onsite and offsite analysis.

The results of this effort are presented in *Aquifer Sampling Tube Completion Report: 100 Area and Hanford Townsite Shorelines* (Peterson et al. 1998). The tubes were sampled in October through November 1998 (Lee and Raidl 2000). Highlights of the results from this sampling include elevated hexavalent chromium in the 100-K, 100-D/DR, and 100-H Areas; elevated gross beta in the 100-B/C and 100-H Areas; and elevated tritium in the 100-B/C Area.

An additional 29 tubes from the 32 planned sites were sampled in the 100-B/C, 100-K, 100-D/DR, 100-H, and 100-F Areas in the fall of 1999 (Lee and Raidl 2000) using the same screening techniques used the 1998 sampling effort.

1.3 CONTAMINANTS OF CONCERN

Contaminants of concern for Aquifer Sampling Tubes are documented in DOE-RL (2000), *Sampling and Analysis Plan for Aquifer Sampling Tubes.*

2.0 PROJECT MANAGEMENT

The following section identifies the individuals or organizations participating in the project and discusses specific roles and responsibilities of the individuals/organizations. This section also discusses the quality objectives for measurement data, and discusses the special training requirements for the staff performing the work.

2.1 PROJECT/TASK ORGANIZATION

The aquifer sampling tube project will be managed through the Groundwater Project, managed by Bechtel Hanford, Inc. (BHI). The task lead is Jane Borghese, CH2M HILL Hanford, Inc. (CHI) and the CHI client services manager is Tim Lee. BHI field support services will provide field management, and the field superintendent will be Scott Strope, BHI. Samplers will be from the CHI analytical field services group managed by Michael Galgoul. A plan of the day meeting will be conducted on a daily basis to discuss safety and sampling objectives, and to provide personnel accountability. Bob Raidl, CHI, will be the daily facilitator for the plan of the day meetings.

2.2 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

The required detection limits and precision and accuracy requirements for each of the analyses to be performed are summarized in Table 1.

Table 1. Contaminants of Concern Analytical Parameters for Aquifer Tube Samples.

COCs	CAS #	MCL[c] GW[a]	Name/ Analytical Technical	Target Required Quantitation Limits	Precision Water	Accuracy Water
Radionuclides		**pCi/L**		**pCi/L**		
Gross alpha	12587-46-1	15	GPC	3	+-20%	70-130%
Gross beta	12587-46-2	50	GPC	4	+-20%	70-130%
Carbon-14	14762-75-5	2,000	Chemical sep. – liquid scintillation	200	+-20%	70-130%
Hydrogen-3 (tritium)	10028-17-8	20,000	Tritium - liquid scintillation	400	+-20%	70-130%
Total radioactive strontium (Sr-90)	Sr-rad	8[c]	Total radioactive strontium – GPC	2	+-20%	70-130%
Chemicals						
Anions		**mg/L**		**mg/L**		
Chloride	16887-48-8	250	Anions - 9056 – IC	0.2	d	d
Fluoride	16984-48-8	4	Anions - 9056 – IC	0.5	d	d
Nitrate (as NO_3)	14797-55-8	45	Reflectometer-MS100 and MS310	5 mg/L		
Nitrite(as NO_2)	14797-65-0	3.3	Anions - 9056 – IC	0.25	d	d
Phosphate	14265-44-2	None	Anions - 9056 – IC	0.5	d	d
Sulfate	14808-79-8	250	Anions - 9056 – IC	0.5	d	d
Sulfide	18496-25-8	2	Sulfide – 9030	0.5	d	d
Metals (Inorganics)		**mg/L**		**mg/L**		
Chromium VI	18540-29-9	0.1	Chromium (hexavalent) - 7196 – colorimetric	0.01	d	d

[a] Unless otherwise noted, radionuclide values were calculated from National Bureau of Standard maximum permissible concentrations (per Handbook 69 [NBS 1963]); chemical values based on maximum contaminant level (40 CFR 141).
[b] Water values for sampling QC (e.g., equipment blanks or rinses) or drainable liquids (if recovered).
[c] Maximum contaminant level (40 CFR 141).
[d] Precision and accuracy requirements as defined for the referenced U.S. Environmental Protection Agency procedures.

AEA = alpha energy analysis
CFR = *Code of Federal Regulations*
GPC = gas proportional counting
GW = groundwater
IC = ion chromatography
ICPMS = inductively coupled plasma/mass spectrometry
TBD = to be determined

Selected aquifer tubes (Table 3) will be sampled for gamma spectrometry using the RCRA groundwater list using laboratory specific methods. These analytes are included in Table 2.

Table 2. Gamma Spectrometry Sampling.

Radionuclide	CAS No.	MDL (pCi/L)
Cesium-137	10045-97-3	15
Cobalt-60	10198-40-0	25
Beryllium-7	13966-02-4	50
Antimony-125	14234-35-6	50
Europium-155	14391-16-3	50
Europium-152	14683-23-9	50
Europium-154	15585-10-1	50

2.3 SPECIAL TRAINING REQUIREMENTS

Personnel training or certification requirements are described in BHI-HR-02, *ERC Training Procedures*, and BHI-QA-03, *ERC Quality Assurance Program Plans*, Procedure Nos. 5.1, 5.2, and 5.3. Field personnel shall have completed the following mandatory training before starting work:

- Occupational Safety and Health Administration 40-Hour Hazardous Waste Worker Training
- Radiation Worker Training
- Hanford General Employee Training

Training will be required for use of field screening instruments and onsite analytical equipment including BHI-EE-05 procedures as follows:

- Procedure 1.9, "Field Immunoassay Test Kits"
- Procedure 1.12, "Determination of Nitrate in Water by a Reflectometry-Based Instrument"
- Procedure 1.17, "Determination of Hexavalent Chromium in Water, Wastewater, and Soils Utilizing the HachDR/2000 and DR/2010 Spectrophotometers."

3.0 MEASUREMENT/DATA ACQUISITION

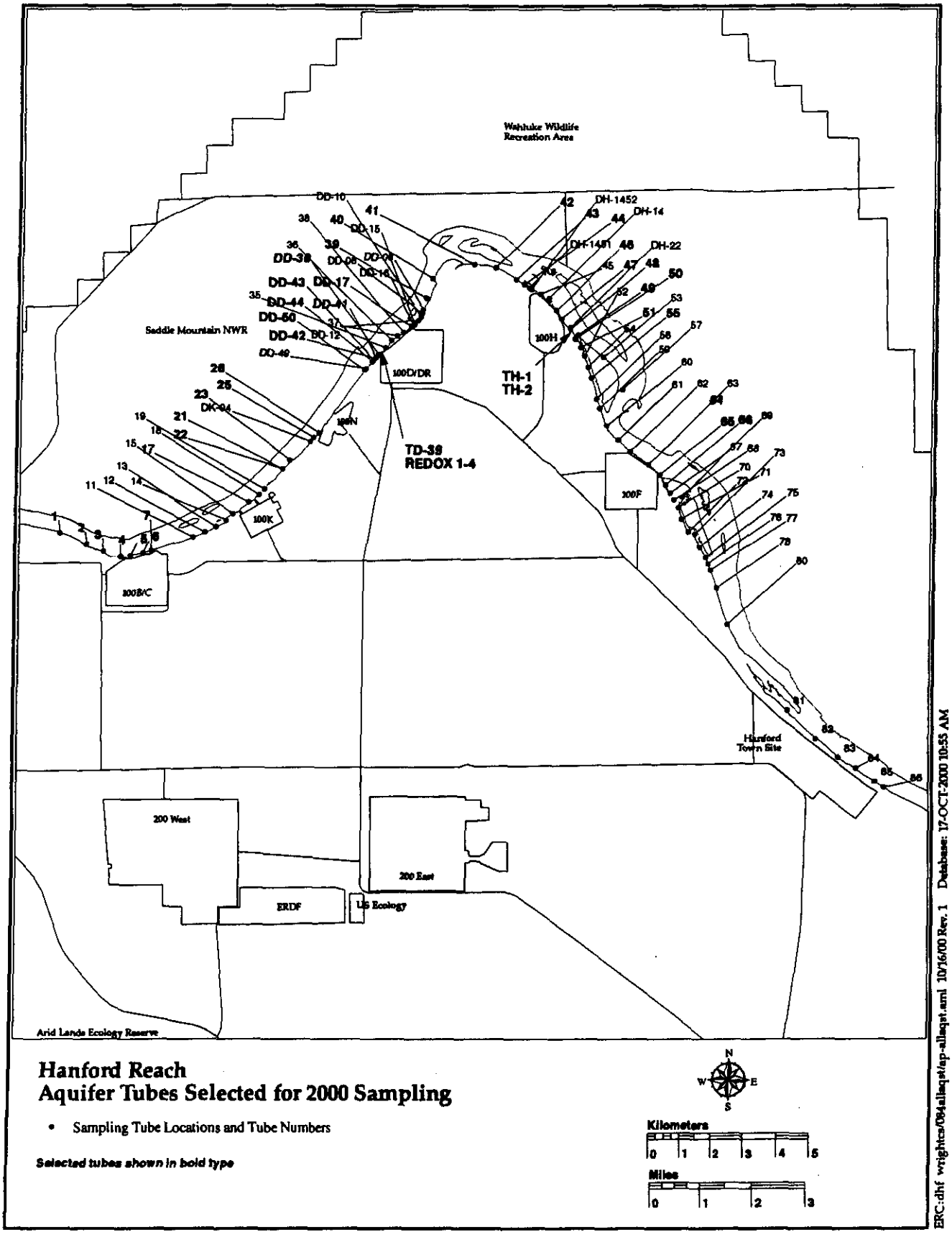
The following section presents the sampling process design, along with the requirements for sampling methods, sample handling, custody, preservation, containers, and holding times. This section also addresses the requirements for field and laboratory quality control (QC), instrument calibration and maintenance, and field documentation.

3.1 SAMPLING PROCESS DESIGN

Aquifer sampling tube sites, as shown in Figure 1, were selected for the Fall 2000 sampling round based on meeting one or more of the following criteria:

- A contaminant identified previously in a sample collected from the tube was present in concentrations above MCLs or the pump and treat action level for hexavalent chromium (20 µg/L)
- The aquifer tube site is adjacent to an active surface source remediation that could impact downgradient water quality
- The aquifer tube site would provide coverage to fill in gaps between groundwater monitoring wells
- The aquifer tube site would provide a background sample.

Figure 1. Northern Portion of the Hanford Site and Aquifer Sampling Tube Sites.



Samples will be collected from aquifer tube sites as close as possible to the date that nearby CERCLA groundwater monitoring wells are sampled.

Site selection was discussed with the Department of Ecology and with EPA on October 5, 2000. Meeting minutes are attached as Attachment A.

Table 3. Sampling Locations and Required Analytes.[a] (2 Pages)

Tube No.[b]	Hexavalent Chromium	Nitrate	Sulfate	Gross Beta	Spectral Gamma	Strontium 90	Tritium	Carbon-14
100-BC-5								
1M/S[c]	X			X			X	
2S	X			X			X	
3M/D	X			X			X	
04/S/M/D	X			X		X	X	
05-S/M/D	X			X	X	X	X	
06-S/M/D	X			X	X	X	X	
07-M/D	X			X	X	X	X	
100-KR-4								
19-M/D	X					X	X	X
21-S/M	X							
22-M/D	X							
23-M/D	X							
25D	X							
26-S/M/D	X							
100 D/DR								
DD-50-2	X		X					
DD-44-4	X		X					
DD-39-3	X		X					
39-S/M	X							
40S	X							
41-M/D	X							
DD-17-3	X							
DD-41	X		X					
DD-42	X		X					
DD-43	X		X					
ISRM Porewater Tubes								
Redox-1	X		X					
Redox-2	X		X					
Redox-3	X		X					
Redox-4	X		X					
TD-39	X		X					
100-H								
42-S/M	X							
43-M/D	X							
44-M/D	X							
46-D	X							
47-M/D	X			X	X	X		
48-S/M	X			X	X	X		
49-S/M/D	X			X	X	X		
50-S/M	X	X						
51-S/M/D	X							
55-S	X							
100-H Porewater Tubes								
TH-1	X							

Table 3. Sampling Locations and Required Analytes.[a] (2 Pages)

Tube No.[b]	Hexavalent Chromium	Nitrate	Sulfate	Gross Beta	Spectral Gamma	Strontium 90	Tritium	Carbon-14
TH-2[c]	X							
100-FR-3								
64-D	X					X	X	
65-S/M	X					X	X	
66S/M/D	X					X	X	

[a]Analyte priority as follows: hexavalent chromium, strontium-90, gross beta, spectral gamma, carbon-14, tritium, sulfate, nitrate.
[b]All Tubes in cluster will be sampled, highest conductivity will be saved for analysis.
[c]Sampling conditional based on success in adjacent tube sites or tube survival.
D = deep
M = mid depth
S = shallow

3.2 SAMPLING METHODS REQUIREMENTS

Samples will be collected using a peristaltic pump. Analyte suite, QC samples, and analytical method requirements (specified in Table 3) will dictate sample volumes. Final sample volumes and containers are specified in the SAF .

The aquifer tube sampling procedure is described below:

1. Confirm that selected tubes remain.

2. Re-label, if necessary.

3. Collect a water sample from each tube, measuring specific conductance.

4. If highest specific conductance is >200 µS/cm, continue with sampling.

5. Measure field parameters (i.e., temperature, pH, specific conductance, turbidity, and dissolved oxygen).

6. Collect samples in accordance with the analyte list for the tube site as specified in the FY 2000 SAI and the SAF.

7. If the tube with highest specific conductance does not produce an adequate amount of water for sampling, proceed to tube with next highest specific conductance and attempt to collect samples.

8. If none of the tubes at a site produces an adequate amount of water for sampling, select the tube with the highest specific conductance and collect samples in accordance with the priorities specified in the FY SAI.

9. Measure conductivity (field parameter) of river water.

10. After sampling is completed, measure field parameters as specified in the FY SAI.

11. Document all measurements and field sampling observations in a field logbook in accordance with BHI-EE-01, Procedure 1.5, "Field Logbooks."

12. Place the tubes back into the PVC, if winterized, recap, re-flag, and prepare a site map that will assist future sampling efforts to locate aquifer tubes.

13. Move to the next site.

The ERC will perform field screening analysis in accordance with BHI-EE-01 and BHI-EE-05. Selected field methods include the following:

- Procedure 1.12, "Determination of Nitrate in Water by a Reflectometry Based Instrument"
- Procedure 1.17, "Determination of Hexavalent Chromium in Water, Wastewater, and Soils Utilizing the HachDR/2000 and DR/2010 Spectrophotometers"

In addition to field screening procedures outline in DOE-RL (2000), selected samples (Table 3) will be field screened for sulfate using the manufacturer's procedures for determination for sulfate in water and wastewater utilizing the HachDR/2000 and DR/2010 spectrophotometers.

Field pH, conductivity, turbidity, dissolved oxygen, and temperature measurements will be performed in accordance with the manufacturer's instructions for the instrument.

3.3 SAMPLE HANDLING, SHIPPING, AND CUSTODY REQUIREMENTS

All sample handling, shipping, and custody should be performed in a accordance with BHI-EE-01, Procedure 3.1, "Sample Packaging and Shipping"; Procedure 3.0, "Chain of Custody"; and Procedure 4.2, "Sample Storage and Shipping Facility."

3.4 SAMPLE PRESERVATION, CONTAINERS, AND HOLDING TIMES

The sample preservation, container, and holding time requirements for the offsite analyses to be performed are summarized in Table 4.

Table 4. Holding Times, Volume Requirements, and Containers for Potential Groundwater Analyses. (2 Pages)

Lab Code	Class	Method Name	Holding Time	Bottle Type	No. Bottles	Volume	Units
Radionuclides							
STLRL	RAD	906.0_H3_LSC	6 months	P	1	1,000	mL
TMA	RAD	906.0_H3_LSC	6 months	P	1	1,000	mL
STLRL	RAD	ALPHA_GPC	6 months	G/P	1	600	mL
STLRL	RAD	ALPHA_GPC	6 months	G/P	1	1,000	mL
TMA	RAD	ALPHA_GPC	6 months	G/P	2	1,000	mL
WSCF	RAD	ALPHA_GPC	6 months	G/P	1	1,000	mL
STLRL	RAD	BETA_GPC	6 months	G/P	1	600	mL
STLRL	RAD	BETA_GPC	6 months	G/P	1	1,000	mL

Table 4. Holding Times, Volume Requirements, and Containers for Potential Groundwater Analyses. (2 Pages)

Lab Code	Class	Method Name	Holding Time	Bottle Type	No. Bottles	Volume	Units
Radionuclides							
TMA	RAD	BETA_GPC	6 months	G/P	2	1,000	mL
WSCF	RAD	BETA_GPC	6 months	G/P	1	1,000	mL
STLRL	RAD	C14_LSC	6 months	G/P	1	1,500	mL
TMA	RAD	C14_LSC	6 months	G/P	1	1,000	mL
222-S	RAD	GAMMA_GS	6 months	G/P	1	1,000	mL
STLRL	RAD	GAMMA_GS	6 months	G/P	1	2,250	mL
TMA	RAD	GAMMA_GS	6 months	G/P	1	1,000	mL
WSCF	RAD	GAMMA_GS	6 months	G/P	1	1,000	mL
222-S	RAD	SRTOT_SEP_PRECIP_GPC	6 months	G/P	1	1,000	mL
STLRL	RAD	SRTOT_SEP_PRECIP_GPC	6 months	G/P	3	1,000	mL
TMA	RAD	SRTOT_SEP_PRECIP_GPC	6 months	G/P	2	1,000	mL
WSCF	RAD	SRTOT_SEP_PRECIP_GPC	6 months	G/P	1	1,000	mL
222-S	RAD	GAMMA_GS WATER		G/P	1	100	g
222-S	RAD	GAMMA_GS WATER	6 months	G/P	1	1,000	mL
STLRL	RAD	GAMMA_GS WATER	6 months	G/P	1	1,500	g
STLRL	RAD	GAMMA_GS WATER	6 months	G/P	1	2,250	mL
TMA	RAD	GAMMA_GS WATER	6 months	G/P	1	1,000	mL
TMA	RAD	GAMMA_GS WATER	6 months	G/P	1	1,500	g
WSCF	RAD	GAMMA_GS WATER	6 months	G/P	1	100	g
WSCF	RAD	GAMMA_GS WATER	6 months	G/P	1	1,000	mL

Specific field analyses requirements include the following:

- Chrome 6-Hach: If water samples cannot be analyzed within 4 hours, samples should be stored at 4°C (±2°C) for up to 24 hours. All water samples shall be analyzed within 24 hours of sample collection.

- Nitrate: The nitrate test should be performed as soon as possible (no later than 24 hours) after samples are collected

- Sulfate: According to the manufacturer's procedures for determination for sulfate in water and wastewater utilizing the HachDR/2000 and DR/2010 spectrophotometers.

3.5 QUALITY CONTROL REQUIREMENTS

The minimum number of QC samples required for the analytical laboratory are to be conducted in accordance with established laboratory contracts and are summarized below:

- One laboratory method blank for every 20 samples (5% of all samples), analytical batch, or sample delivery group (whichever is most frequent) will be carried through the complete sample preparation and analytical procedure. The method blank will be used to document contamination resulting from the analytical process.

- A matrix spike sample will be prepared and analyzed for every 20 samples (as applicable to the method used) of the same matrix or sample preparation batch, whichever is most frequent. The matrix spike results are used to document the bias of an analytical process in a given matrix.

- Laboratory duplicates or matrix spike duplicates will be used to assess precision and will be analyzed at the same frequency as the matrix spikes.

The field QC sample requirements are as follows:

- Field duplicate samples will be collected at a minimum frequency of 1 per 20 samples. Field duplicates are analyzed independently and provide information concerning the homogeneity of the matrix, as well as an evaluation of the precision of the sampling and analysis process.

- Split samples will be collected at a minimum frequency of 1 per 20 samples. Field split samples are two uniquely numbered samples produced through homogenizing a field sample and separating the sample material into two separate aliquots. Field split samples will be routed to separate laboratories for independent analysis, generally for the purposes of auditing the performance of the primary laboratory relative to a particular sample matrix and analytical method. Split samples may also be collected by regulatory agencies at any time deemed appropriate by the agencies.

3.6 INSTRUMENT CALIBRATION AND MAINTENANCE

All field screening and analytical instruments shall be calibrated and maintained in accordance BHI-QA-03, Plan No. 5.2, "Onsite Measurements Quality Assurance Program." The results from all instrument calibration and maintenance activities shall be recorded in a bound logbook in accordance with procedures outlined in BHI-EE-01, Procedure 1.5, "Field Logbooks." Tags will be attached to all field screening and onsite analytical instruments noting the date when the instrument was last calibrated and the calibration expiration date.

3.7 FIELD DOCUMENTATION

Field documentation shall be kept in accordance with BHI-EE-01, *Environmental Investigation Procedures*, including the following procedures:

- Procedure 1.5, "Field Logbooks"
- Procedure 1.13, "Environmental Site Identification and Information Reporting"
- Procedure 3.0, "Chain of Custody."

4.0 ASSESSMENTS AND RESPONSE ACTIONS

The Compliance and Quality Programs group may conduct random surveillance and assessments in accordance with BHI-MA-02, *ERC Project Procedures*, Procedure 5.3, "Self-Assessments," to

verify compliance with the requirements outlined in this sampling and analysis instruction, project work packages, the BHI quality management plan, and BHI procedures and regulatory requirements.

Deficiencies identified by one of these assessments shall be reported in accordance with BHI-MA-02, Procedure 5.3, "Self-Assessments." When appropriate, corrective actions will be taken by the Project Engineer in accordance with the *Hanford Analytical Services Quality Assurance Requirements Document* (HASQARD), Volume 1, Section 4.0 (DOE-RL 1996a), to minimize recurrence.

5.0 DATA VERIFICATION AND VALIDATION REQUIREMENTS

Data validation and verification are not required by this project. Other programs for aquifer tube samples (e.g., In Situ Redox Manipulation compliance sampling) may require project-specific data validation and verification. In those cases, verification and validation will be carried out using program-specific data validation procedures.

6.0 MANAGEMENT OF INVESTIGATION-DERIVED WASTE

Waste, including purgewater, generated by sampling activities will be managed in accordance with existing regulator-approved waste management plans or waste control plans. For the aquifer sampling tubes, the approved plans are as follows:

- *Interim Action Waste Management Plan for the 100 HR-3 and 100-KR-4 Operable Units* (DOE-RL 1997)
- *100-BC-5 Operable Unit Waste Control Plan* (Woolard 2000a)
- *100-FR-3 Operable Unit Waste Control Plan* (Woolard 2000b).

7.0 HEALTH AND SAFETY

All field operations will be performed in accordance with BHI health and safety requirements, which are outlined in BHI-SH-01, *Hanford ERC Safety and Health Program*, and the requirements of the *Hanford Site Radiological Control Manual* (HSRCM) (DOE-RL 1996b). In addition, a work control package will be prepared in accordance with BHI-MA-02, which will further control site operations. The work control package will include an activity hazard analysis, site-specific health and safety plan, and applicable radiological work permits.

The sampling procedures and associated activities will consider exposure reduction and contamination control techniques that will minimize the radiation exposure to the sampling team as required by BHI-QA-01, *ERC Quality Program*, and BHI-SH-01, *Hanford ERC Safety and Health Program*.

8.0 REFERENCES

40 CFR 141, "National Primary Drinking Water Regulations," *Code of Federal Regulations*, as amended.

BHI-EE-01, *Environmental Investigations Procedures*, Bechtel Hanford, Inc., Richland, Washington.

BHI-EE-05, *Field Screening Procedures*, Bechtel Hanford, Inc., Richland, Washington.

BHI-HR-02, *ERC Training* Procedures, Bechtel Hanford, Inc., Richland, Washington.

BHI-MA-02, *ERC Project Procedures*, Bechtel Hanford, Inc., Richland, Washington.

BHI-QA-01, *ERC Quality Program*, Bechtel Hanford, Inc., Richland, Washington.

BHI-QA-03, *ERC Quality Assurance Program Plans*, Bechtel Hanford, Inc., Richland, Washington.

BHI-SH-01, *Hanford ERC Safety and Health Program*, Bechtel Hanford, Inc., Richland, Washington.

Borghese, J. V., R. E. Peterson, and K. M. Singleton, 1997, *Description of Work for Installing Aquifer Sampling Tubes Along the 100 Area and Hanford Townsite Shorelines*, BHI-01090, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

DOE-RL, 1996a, *Hanford Analytical Services Quality Assurance Requirements Document* (HASQARD), DOE/RL-96-68, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1996b, *Hanford Site Radiological Control Manual* (HSRCM), DOE/RL-96-109, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1997, *Interim Action Waste Management Plan for the 100-HR-3 and 100-KR-4 Operable Units*, DOE-RL-97-01, Rev. 2, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2000, *Sampling and Analysis Plan for Aquifer Sampling Tubes*, DOE/RL-2000-59, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Hope, S. J. and R. E. Peterson, 1996, *Chromium in River Substrate Pore Water and Adjacent Groundwater: 100-D/DR Area, Hanford Site, Washington*, BHI-00778, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

Lee, T. A. and R. F. Raidl, 2000, *Fall 1999 Aquifer Sampling Tube Results at the 100 Area and Hanford Townsite Shoreline*, CCN 078404, Bechtel Hanford, Inc., Richland, Washington.

NBS, 1963, *Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air or Water for Occupational Exposure*, NBS Handbook 69, as amended, U.S. Department of Commerce, Washington, D.C.

Peterson, R. E., J. V. Borghese, and D. B. Erb, 1998, *Aquifer Sampling Tube Completion Report: 100 Area and Hanford Townsite Shoreline*, BHI-01153, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

Woolard, J. G., 2000a, *100-BC-5 Operable Unit Waste Control Plan*, CCN 0518024, Bechtel Hanford, Inc., Richland, Washington.

Woolard, J. G., 2000b, *100-FR-3 Operable Unit Waste Control Plan*, CCN 0518025, Bechtel Hanford, Inc., Richland, Washington.

ATTACHMENT A
Meeting Minutes of October 5, 2000

Environmental Restoration Contractor **ERC Team**

Meeting Minutes

Job No. 22192
Written Response Required: NO
Due Date: N/A
Actionee: N/A
Closes CCN: N/A
OU: 100 Areas
TSD: N/A
ERA: N/A
Subject Code: 8960

SUBJECT AQUIFER SAMPLING TUBES

TO Distribution

FROM T. A. Lee

DATE October 5, 2000

ATTENDEES
J. V. Borghese (CHI) H0-19
L. E. Gadbois (EPA) B5-01
T. A. Lee (CHI) H9-02
R. F. Raidl (CHI) H9-02
W. W. Soper (Ecology) B5-19
A. C. Tortoso (RL) H0-12

DISTRIBUTION
Attendees
K. A. Anselm H9-03
Document and Information Services H0-09

A meeting on the above subject was held on October 5, 2000, at 3350 George Washington Way, Conference Room 2B32.

Waste

Move tube waste into closest operable unit. Make a list of all tubes, add seep waste. The appendices of the 100-FR-3 and 100-BC-5 waste control plans will be amended to include all of the individual tubes that can be sampled in each tube cluster.

General Comment Regarding Timing of Sample Collection. The regulators requested that aquifer sampling tube samples be collected as close in time as possible to the samples collected from nearby CERCLA wells.

Review of Table

- **100-BC-5**
  - Add tubes 3 and 4 and analyze for gross beta, H3, Cr6, also Sr-90m at site 4
  - Delete nitrate at 5, 6, and 7
  - Add 2 (gross beta, H3, and Cr6) (if 2 is not sampleable, then 1)

- **100-K**
  - Drop 21
  - Add 19 (Cr6, H3, C14, [Sr90])
  - Look at well data around to determine analyte list.

- **100-D/H**
  - Sr-90 at TH-1 and TH-2 (if close, don't sample both); ERC comment is that sampling TH-2 will be conditional; it will not be sampled unless TH-1 does not produce a sample.
  - Add NO3 to analyte list for site 50.

- **100-F**
  - Drop 75
  - Add tubes downstream of dig sites (63 – 65) (Cr6, Sr90, H-3). ERC comment, sites 64, 65, and 66 appear to ring the active source remediation sites in the 100-FR-3 Operable Unit.

Action Items

1. Minutes ready to sign by Friday (Bob Raidl).
2. Create list of tubes and list where waste will go (Bob Raidl).
3. Bob Raidl will check how close TH-1 and TH-2 are to each other.
4. Bob Raidl to look at active remediation at 100-F Area and select tubes downstream.
5. Wayne Soper would be willing to drop some in 100-H to pick up 100-F.
6. Bob Raidl will have sampling and analysis plan, table of tubes, list for waste control and meeting minutes on Friday.

TAL:kaa

ATTACHMENT B
Aquifer Sampling Tube Summary Table, Fall 2000

		CrVI				Gross Beta				Sr-90		NO3				H3				C-14					Additional
		20(ug/L)				(50 pCi/L)				8 pCi/L		45 mg/L				20,000 pCi/L				2000 pCi/L				Sample	Analyses
		1997	1998	1999	2000	1997	1998	1999	2000	1999	2000	1997	1998	1999	2000	1997	1998	1999	2000	1997	1998	1999	2000	fall 2000 ?	fall 2000
Oper Unit	TubeName																								
100-BC-5	1M/S	U			YES	4.24			YES							610			YES					see note 4	Conditional
	2S	U			YES	2.92			YES							1,430			YES					YES	CrVI, H3, beta
	3M/D	U			YES	5.32			YES							8,460			YES					YES	CrVI, H3, beta
	4S/M/D	11	16.1	12	YES	7.5	13	9	YES	U	YES	11	12	16		15,400	16,000	11,100	YES					YES	
	5S/M/D	12	29.3	33	YES	29.5	30	5	YES	17	YES	4	12	18		2,150	5,300	6,100	YES					YES	spectral gamma
	6S/M/D	41	20.1	115	YES	41.8	52		YES	15	YES	32	43	39		47,100	66,000	36,600	YES					YES	spectral gamma
	7M/D	6	20.1	20	YES	20.6	35	25.9	YES	U	YES	22	23	24		18,000	38,000	31,600	YES					YES	spectral gamma
	11D			12						U														NO	
100-KR-4	14S/M/D	U	U	6	YES	27	63	67.1	YES	0.12	YES	14	24	25		2010	4500							YES	spectral gamma
	15M	U				4.95						U				576				13				NO	
	17M/D	6	8.9	6		4.86	4					25	23.1	15		1930	1600		YES	348	680	639		NO	
	18S			2										11			880	68.5			100	5.6		NO	
	19M/D	U			YES	2.8					YES	U				U			YES					YES	
	21S/M	43	23.9			5.73	5.3					U	U			U	U							NO	
	22M/D	59	112	50	YES	41.8	55	4.4		0.19		4	9.84			U	220	178						YES	
	23M/D	81	111	76	YES	3.54	3.9					U	5.35			U	340							YES	
	25D	U			YES	3.12	4.3					U				2020	9200							YES	CrVI
	26S/M/D	U			YES	2.74	1.5					36				855	890							YES	CrVI
																				SO4					
																				250 mg/L					
																				1997	1998	1999	2000		
100-D/DR	DD-50-2	29		34	YES	U						6				20,000			YES			36	YES	YES	
ISRM	DD-44-4	359		330	YES	3.08	1.3					34				17,000		15,000				90	YES	YES	
	DD-39-3	603		641	YES	3.3	3.8					38				U						130	YES	YES	
	36S/M/D	U	11.8	3		3.3	2.1					8	8.1	U		U						22		NO	
	38D/M	U		10.4		4.4	4.3					U	1.93			U	U							NO	
	39M/S	U			YES	5.66										U								YES	CrVI
	40S	U			YES	2.76										U								YES	CrVI
	41M/D				YES																			YES	CrVI
	DD-12-2			6																		12		NO	
	DD-17-3			170	YES																			YES	CrVI/SO4
	DD-41				YES																		YES	YES	CrVI/SO4
	DD-42				YES																		YES	YES	CrVI/SO4
	DD-43				YES																		YES	YES	CrVI/SO4

Aquifer Sampling Tubes
Sample Summary and Proposed Fall 2000 Analyses

		CrVI				Gross Beta				Sr-90		NO3				H3				SO4					additional		
		20(ug/L)				(50 pCi/L)				(8 pCi/L)		NO3 (45 mg/L)				20,000 pCi/L				250 mg/L				Sample	analyses		
		1997	1998	1999	2000	1997	1998	1999	2000	1999	2000	1997	1998	1999	2000	1997	1998	1999	2000	1997	1998	1999	2000	fall 2000	fall 2000		
ISRM	Redox-1				YES																		YES	YES	CrVI/SO4		
Porewater	Redox-2				YES																		YES	YES	CrVI/SO4		
Tubes	Redox-3				YES																		YES	YES	CrVI/SO4		
	Redox-4				YES																		YES	YES	CrVI/SO4		
	TD-39				YES																		YES	YES	CrVI/SO4		
100-H	42S/M	7			YES							9												YES			
	43M/D	11		20	YES	3.55						9		12		2010	2200							YES			
	44M/D	25		49	YES							44												YES			
	45S/M/D	U		3	NO	6.33										U								NO			
	46D	10	32.1	24	YES	4.8	6.7	2.2		2.4		8	16	14		691	1000							YES			
	47M/D	U	71.9	20	YES	54.4	97	21.4	YES	9.6	YES	25	23	6		391	1200							YES	spectral gamma		
	48S/M	6		60	YES	6.58	28	7.5	YES	U	YES	7				1240	3200							YES	spectral gamma		
	49S/M/D	16		30	YES	4.59	6.4	4.9		U		9	14	29		2830	2500							YES			
	50S/M	13		43	YES	4.71	5.8					9	23	55	YES	2480	3500							YES			
	51S/M/D	29	49		YES	3.53	5.2					19	28			3060	3800							YES			
	52S/M/D	U				4.7						U				398								NO			
	54S/M/D	U				4.56						U				563								NO			
	55S	9	11	21	YES	3.4	1.9					9	13	21		1790	2100							YES			
	58S/M/D	U	6			8.13	2.9					11	12			U	U							NO			
	59S/M	U				7.6						14.7				U								NO			
	60S/M	U				12.3						U				U								NO			
100-H	TH-1				YES				YES		YES													YES	CrVI, beta, Sr-90		
Porewater	TH-2				YES				YES		YES													see note 5	CrVI		
Tubes																											
100-FR-3	61S/M/D	U				3.96						U				U								NO			
	62S/M	U				3.96	3					16				U	U							NO			
	64D	U		8	YES	7.7	7.2				YES	11				U	U		YES					YES			
	65M/S				YES						YES								YES					YES			
	66S/M/D	U			YES	U	3.6				YES	U				300			YES					YES			
	74S/M	9		11		8	7.4					8		21			730							NO			
	75S/M/D	15		16		15	5.9					30		54			930							NO			
	76S/M/D	U				U	4.2					12					1100							NO			
Hanford	84S/M/D						3.9																	NO			
Townsite																											
Totals					41				10		11				1				8				11				
(plus I C-14)																											

Aquifer Sampling Tubes
Sample Summary and Proposed Fall 2000 Analyses

Notes:
1. S/M/D: shallow, middle, deep in tube cluster.
2. U: not detected in analysis
3. Reference to 2000 is the October/November 2000 (FY 2001).
4. Sample only if site 2 not found or does not produce water.
5. Sample only if TH-1 does not produce a sample.

Aquifer Sampling Tubes
Sample Summary and Proposed Fall 2000 Analyses

ATTACHMENT C
100-BC-5 Groundwater Well Aquifer Sampling Tube and Seep List from 100-BC-5 Waste Control Plan

100-BC-5 OPERABLE UNIT GROUNDWATER WELL AND SEEP LIST

199-B2-12	199-B3-1	199-B3-46
199-B3-47	199-B4-1	199-B4-4
199-B4-5	199-B4-6	199-B4-7
199-B5-1	199-B5-2	199-B8-6
199-B9-2	199-B9-3	699-63-90
699-65-72	699-65-83	699-66-64
699-67-86	699-72-73	699-72-88
699-72-92	SEEP 037-1	SEEP 039-2
SEEP SB-037-1	SB-038-3	SB-039-2

AQUIFER SAMPLING TUBES

TUBE NUMBER	TUBE ID
1M	B8114
1S	B8115
2S	B8118
3D	B8119
3M	V8120
4D	B8122
4M	B8123
4S	B8124
5D	B8125
5M	B8126
5S	B8127
6D	B8128
6M	B8129
6S	B8130
7D	B8131
7M	B8132
11D	B8143
12D	B8146

ATTACHMENT D
100-FR-3 Groundwater Well Aquifer Sampling Tube and Seep List from 100-FR-3 Waste Control Plan

100-FR-3 OPERABLE UNIT GROUNDWATER WELL AND SEEP LIST

199-F1-2	199-F5-1	199-F5-3
199-F5-4	199-F5-5	199-F5-6
199-F5-42	199-F5-43A	199-F5-43B
199-F5-44	199-F5-45	199-F5-46
199-F5-47	199-F5-48	199-F6-1
199-F7-1	199-F7-2	199-F7-3
199-F8-2	199-F8-3	199-F8-4
699-71-30	699-74-44	699-77-36
699-80-43S	699-81-38	699-82-32
699-82-34	699-83-47	699-84-35A
SEEP 187-1	SEEP 190-4	SEEP 207-1
SEEP SF-187-1	SEEP SF-190-4	SEEP SF-207-1
SEEP SF-211-1		

AQUIFER SAMPLING TUBES

TUBE NUMBER	TUBE ID	TUBE NUMBER	TUBE ID
61D	BB331	71D	B8361
61N	B8332	72D	B8364
61S	B8333	72M	B8365
62M	B8335	72S	B8366
62S	B8336	73D	B8367
63M	B8338	73M	B8368
63S	B8339	73S	B8369
64D	B8340	74D	B8370
64M	B8341	74M	B8371
64S	B8342	74S	B8372
65M	B8344	75D	B8373
65S	B8345	75M	B8374
66D	B8346	75S	B8375
66M	B8347	76D	B8376
66S	B8348	76M	B8377
67M	B8350	76S	B8378
67S	B8351	77D	B8379
68D	B8352	77M	B8380
68M	B8353	77S	B8381
68S	B8354	78M	B8383
69M	B8356	78S	B8384
70D	B8358	80D	B8388
70M	B8359	80M	B8389
70S	B8360	80S	B8390

083363

~~083343~~ KLW 10/24/95

81M	B8392	81S	B8393
82S	B8396	84D	B8400
84M	B8401	84S	B8402
85D	B8403	85M	B8404
85S	B8405	86D	B8406
85M	B8407	85S	B8408

083363 ~~083343~~ 10/26/01

DISTRIBUTION
FISCAL YEAR 2001 AQUIFER TUBE SAMPLING

Arlene Tortoso ..... DOE-RL RP (H0-12)
Marvin Furman ..... DOE-RL RP (A5-13)

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Wayne Soper ..... WDOE (Kennewick) (B5-18)

Jeff Armatrout ..... BHI (H0-19)
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Greg Mitchem ..... BHI (H0-21)
Joan Woolard ..... BHI (H0-02)

Kim Anselm ..... CHI (H9-03)
Jane Borghese ..... CHI (H0-19)
Tim Lee ..... CHI (H9-02)
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